

Isolasi dan Karakterisasi Rare-actinomycetes dari Tanah di Bawah Pohon Gmelina (S3.1) = Isolation and Characterization of Rare-actinomycetes from Soil under Gmelina Tree (S3.1)

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Abstrak

Rare-actinomycetes merupakan kelompok bakteri Gram positif, berfilamen, dan berpotensi menghasilkan senyawa bioaktif, tetapi sulit diisolasi dan ditumbuhkan pada kondisi laboratorium. Penelitian ini bertujuan untuk memperoleh serta mendeskripsikan karakter genotipik dan fenotipik dari isolat rare-actinomycetes yang diisolasi dari sampel tanah (S3.1) di bawah pohon Gmelina dalam hutan kawasan geotermal Cislok. Metode isolasi yang digunakan meliputi pengayaan sampel, metode spread, dan metode tebar menggunakan medium 10% R2A dan ISP 1 cair dengan penambahan cycloheximide 100 ppm dan sodium azide 60 ppm. Lima isolat terpilih dari total 18 isolat kemudian dilakukan karakterisasi genotipik dan fenotipik. Karakterisasi genotipik dilakukan dengan sequencing gen 16S rRNA dan rekonstruksi pohon filogenetik menggunakan metode Neighbor-Joining (NJ), Maximum Likelihood (ML), dan Minimum Evolution (ME). Karakterisasi fenotipik mencakup observasi morfologi koloni, pengecatan Gram, uji pertumbuhan pada variasi suhu (25–55°C), variasi medium agar (ISP 1, ISP 2, ISP 3, MB, dan R2A), serta uji aktivitas enzim katalase. Kelima isolat menunjukkan karakteristik Gram positif, berbentuk filamen, bersifat mesofilik, serta menunjukkan pertumbuhan pada semua variasi medium dan memiliki aktivitas katalase. Hasil analisis sekuens gen 16S rRNA menunjukkan bahwa isolat S3.1.1 berkerabat dekat dengan *Micromonospora echinofusca* DSM 43913 (99,35%), isolat S3.1.2 dengan *Actinomadura nitritigenes* DSM 44137 (99,78%), isolat S3.1.3 dengan *Streptomyces hirosheimensis* NBRC 3839 (99,43%), isolat S3.1.4 dengan *Micromonospora chersina* DSM 44151 (99,71%), dan isolat S3.1.5 dengan *Streptomyces cadmiisoli* ZFG47 (99,24%). Penemuan rare-actinomycetes dari sampel tanah kawasan geotermal ini merupakan kontribusi penting terhadap eksplorasi keanekaragaman mikroorganisme asli Indonesia dan berpotensi untuk dikembangkan lebih lanjut.

.....Rare-actinomycetes are a group of Gram-positive, filamentous bacteria with the potential to produce bioactive compounds, yet they remain understudied. This study aims to isolate and describe the genotypic and phenotypic characteristics of rareactinomycetes from a soil sample (S3.1) collected beneath a Gmelina tree in the geothermal forest area of Cislok. The isolation methods used in this study were sample enrichment, spread plate and direct-method using 10% R2A and ISP 1 liquid media supplemented with 100 ppm cycloheximide and 60 ppm sodium azide. From a total of 18 isolates, five representative isolates were selected for genotypic and phenotypic characterizations. Genotypic characterization was conducted through 16S rRNA gene sequencing and phylogenetic tree reconstruction using the Neighbor-Joining (NJ), Maximum Likelihood (ML), and Minimum Evolution (ME) methods. Phenotypic characterization included observation of colony morphology, Gram staining, growth tests at various temperatures (25–55°C), growth on different agar media (ISP 1, 2, 3, MB, and R2A), and catalase activity assays. All five isolates were Gram-positive, filamentous, mesophilic, capable of growing on all tested media, and exhibited catalase activity. The 16S rRNA gene sequence analysis revealed that isolate S3.1.1 is closely related to *Micromonospora echinofusca* DSM 43913 (99.35%), isolate S3.1.2 to *Actinomadura nitritigenes* DSM

44137 (99.78%), isolate S3.1.3 to *Streptomyces hiroshimensis* NBRC 3839 (99.43%), isolate S3.1.4 to *Micromonospora chersina* DSM 44151 (99.71%), and isolate S3.1.5 to *Streptomyces cadmiisoli* ZFG47 (99.24%). The discovery of rare actinomycetes from geothermal soil samples represents an important contribution to the exploration of Indonesia's indigenous microbial diversity and offers promising potential for future research and development.